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Grain Market Structure, Flows, and Functions of Elevator and Processing Firms

E. DEAN BALDWIN
JOHN W. SHARP

OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER
U. S. 250 and Ohio 83 South
Wooster, Ohio

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E. DEAN BALDWIN and JOHN W. SHARP

INTRODUCTION

The grain industry in Ohio is undergoing radical change in the production and marketing of grain. In 1962, 162 million bushels of corn, wheat, and soybeans were sold from farms. These sales constituted 24% of the total cash receipts by Ohio farmers. By 1974, grain sales totaled 304 million bushels and constituted 47% of the cash receipts by Ohio farmers.

This radical production change is the result of several economic factors. First, since the Federal government has instituted incentives in the farm program, idle acres have come into production. Between 1962 and 1974, harvested acres increased by 47%. Second, improvements in technologies increased yields. Third, changes in grain prices were relatively favorable to changes in prices of other products. Between 1962 and 1974, grain prices paid to farmers increased by 166% while beef, pork, and milk prices increased by 94%, 100%, and 110%, respectively.

Other factors having an impact on the grain marketing system include changes in harvesting techniques, transportation, and trade policies. Transportation policy changes include changes in rail rates; the introduction of rail abandonment policy; the introduction of super highways, hopper cars, and rent-a-trains; and the widening and deepening of ports and canals. Trade policy changes with an impact on the grain marketing system include changes in exchange rates, embargo directives, and the introduction of favored nation treaties and trade agreements. These factors have not only altered the grain marketing structure but have varied the grain flow patterns. Firms at all levels of the marketing channel are investing in new facilities to efficiently perform the marketing functions.

Drying and storage facilities are being constructed at the commercial level as well as on farms. Some grain marketing firms are considering new building sites and others are going out of business. Farms are becoming larger and delivering grain to processors and terminals as well as to country elevators. Grain produced in the United States has become an international commodity, with world markets having a relevant influence on price and grain movements. Firms from Ohio are currently supplying grain to the Southeastern and Northeastern United States and to export points.

To efficiently supply grain to the external markets and to meet the demands of the existing grain processing industry and farms in Ohio, accurate information is needed on the interstate and intrastate grain flows and on the types of services which commercial firms are presently performing. This study is an attempt to provide information to commercial firms and farms alike in order that more systematic and efficient adjustments in marketing procedures and policies can be made. To this end, the commercial grain marketing structure is described. The importance of domestic and export markets is identified. Grain movements by water, truck, and transportation modes are specified. General implications of the forthcoming rail abandonment policies are noted.

These data will also be used in future analytical work to analyze changes in the structure and grain flow patterns of the Ohio grain industry. By incorporating secondary data from other participating states[2] in the forthcoming work, changes in the regional and national grain marketing system can be analyzed. Factors which will alter the grain marketing system, and which must be considered in the future analysis, include changes in national supply, demand, and transportation policies.

THE SURVEY

To ascertain Ohio's grain marketing structure and the 1970 intrastate and interstate grain flows, a stratified random sample of country elevators, terminal elevators, export elevators, and grain processors was surveyed in 1971 by SM-42 marketing areas.[3] The state was divided into two areas along crop reporting district (CRD) lines. Area 50 was composed of CRD's 1, 2, 3, 6, and 9, while area 25 constituted CRD's 4, 5, 7, and 8 (Figure 1). The data collected from each firm in the sample were obtained through personal interviews with the general manager or accountant of each grain merchandising firm.

Since all elevator and grain processing firms were licensed by the Grain Warehouse Division, Ohio Dept.

[1]The work reported in this publication is a part of the contribution of the Ohio Agricultural Research and Development Center to Southern Regional Grain Marketing Project, SM-42.

[2]States participating in the SM-42 research project include Alabama, Arkansas, South Carolina, Mississippi, Tennessee, Georgia, Kentucky, Louisiana, Indiana, Illinois, and Ohio.

[3]The SM-42 marketing areas were defined along crop reporting district lines by staff representatives serving on the Southern Regional Grain Marketing Research Project, SM-42. The areas were selected based on similarities in the grain marketing structure and grain flow patterns.

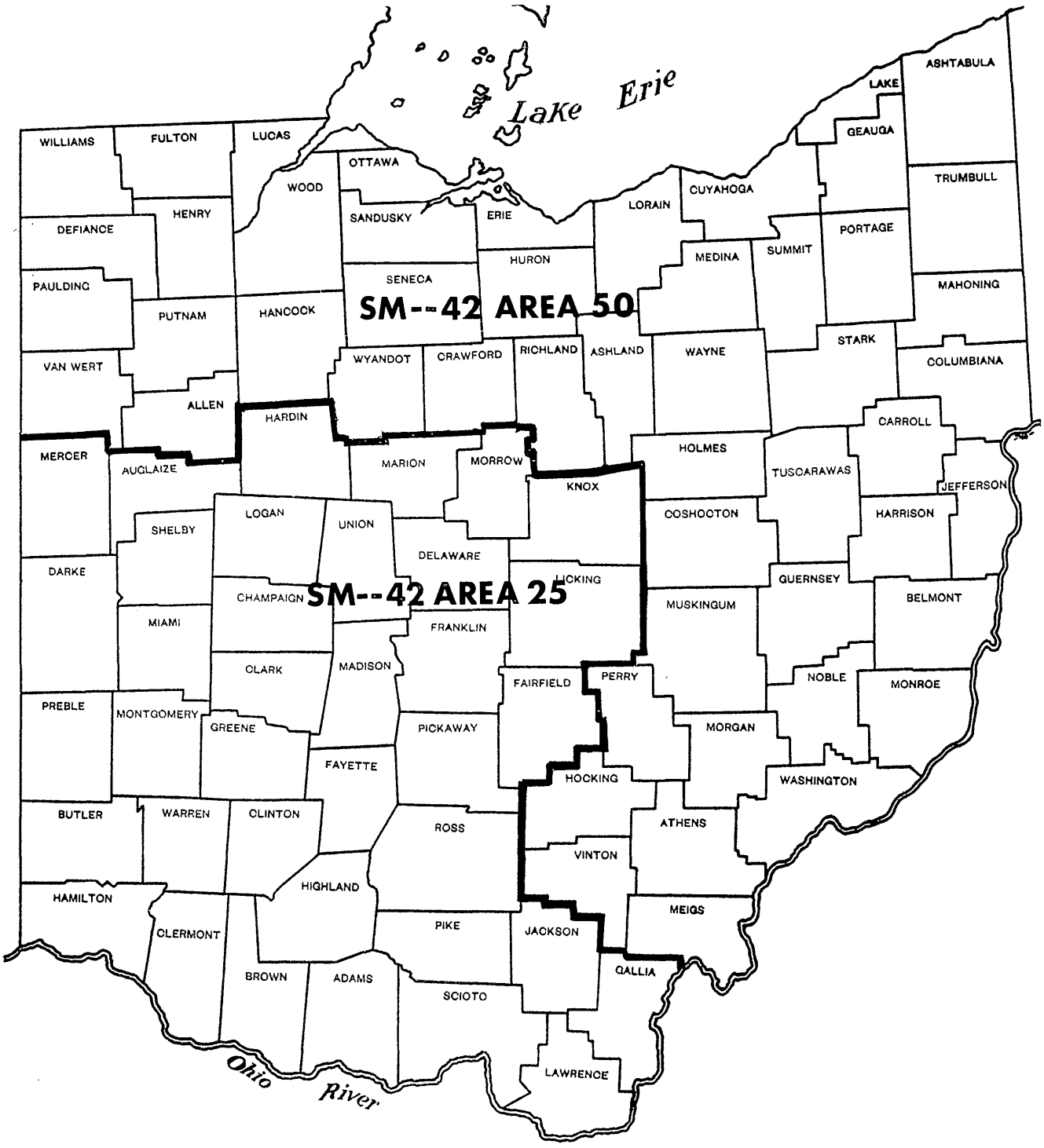

FIG. 1.—Defined SM-42 grain marketing areas in Ohio.

TABLE 1.—Number of Country, Terminal, and Export Elevators and Processing Firms by Size of Storage Capacity, Ohio, 1970.

Firm Type	Total Number of Firms	Number of Elevators — Storage Capacity (000 bu.) 0 to 99	100 to 299	300 to 499	500 to 699	700 to 899	900 to 1099	1100 to 2999	3000 to 4999	5000 and over
Elevators										
Country	470	324	76	33	11	9	7	8	2	
Terminal and Export	14		1	1		1		6	3	2
Processors										
Feed Manufacturers	8	4	2	1	1					
Soybean Processors	3				1		1		1	
Flour Millers and Blenders	6		1	1	1			2		1

of Agriculture, the elevator and processing populations were obtained from lists compiled by this agency.[4] In 1970, 484 grain elevator firms were reportedly in business in Ohio. The respective elevator firms were divided into groups based on existing storage capacity. All elevators in the 500,000 or more bushel group were enumerated. Firms with 100,000 to 499,999 bushels of capacity and those with less than 100,000 bushels were enumerated at 20% and 10% levels, respectively. The results from the proportional sample were then expanded to represent the marketing activities of all firms in the state.

Because feed manufacturers, soybean processors, and flour millers and blenders receive and ship grain, the activities of these processing firms were also analyzed in this study. Feed manufacturers were defined as those firms which produced and marketed a "brand name feed" to a wholesale outlet. Since only eight feed manufacturers and processing firms in Ohio satisfy the above definition, the entire population was enumerated. Most small feed mills which only mix or grind feed for farms did not participate in interstate grain movements. Hence, these firms were excluded from the feed manufacturing population and were not enumerated in this study. The total populations of three soybean processing firms and six flour mills were also enumerated.

FIRM CHARACTERISTICS AND ACTIVITIES

A country elevator was defined as a firm whose primary activity was collecting and merchandising raw grain. Each firm must receive more than 50% of its raw grain directly from farms and must ship at least 50% of its raw grain supply to other firms including farms. A terminal elevator was also defined as a firm whose primary activity was collecting and merchandising raw grain. However, these firms must receive more than 50% of the raw grain from firms other than farms. In addition, the terminal elevator must ship more than 50% of the raw grain supply to other firms including farms. To be classified as an export elevator, each firm must assemble grain from internal markets and merchandise at least 50% of its grain supply into the export market.

Country Elevators

In Ohio, 470 firms were defined as country elevators. Approximately 85% had less than 300,000 bushels of storage capacity (Table 1). Although some small elevators were going out of business, and new large elevators were being constructed, more than 69% of all country elevators had less than 100,000 bushels of storage capacity, while only 3.6% had more than 900,000 bushels. In 1970, the storage capacity for all country elevators averaged 152,400 bushels.

In addition to receiving, storing, conditioning, shipping, and processing grain, country elevators provide a wide variety of services to their customers (Table 2). More than 84% of all country elevators retail farm supplies; more than 92% grind, mix, and sell feed; and more than 94% sell fertilizer. The wide variety of services offered indicates that country elevators are not highly specialized firms. Since the delineation of data suggests that small firms provide about the same array of services as larger firms, country elevators are obviously not specialized by size.

Terminal Elevators

A terminal elevator was defined as a firm whose primary activity consisted of collecting and merchandising raw grain. More than 50% of the grain supply had to be derived from firms other than farms, and more than 50% of the raw grain had to be supplied to other firms including farms. Since most elevators currently receive grain directly from farms, some firms which traditionally called themselves terminal elevators were classified in this study as country elevators.

To be classified as an export elevator, each firm must export more than 50% of all grain receipts. Be-

[4]Unpublished Licensed Warehouse and Dealer List, Grain Warehouse Section, Division of Administration, Ohio Dept. of Agriculture, Columbus.

cause only a small number of elevators met this requirement, data on export elevators were included with the terminal elevator data. This aggregation procedure helps minimize the disclosure problems. Hereafter, all references to terminal elevators also include data relating to export elevators.

The storage capacity of the 14 terminal elevators averaged 2.9 million bushels (Table 1). Although the terminal elevators were larger and handled more grain per firm than the average country elevator, terminal elevators were no more specialized than the country elevators. In 1970, approximately 86% of all terminal elevators reported receiving some grain directly from farmers, while 100% reported receiving grain from other non-farm sources. Approximately 79% of all terminals reported storing grain for farms, and 86% reported storing grain for non-farm firms. Since only 28.6% of these firms perform the drying function, these elevators were relying on country elevators or farmers to dry grain. Besides merchandising grain, some of these elevators also engage in a range of other services such as selling fertilizer, feed, and farm supplies.

Grain Processing Firms

In 1970, feed manufacturing firms which produced and marketed a brand name of feed to a wholesale outlet reported producing an average of 92,285 tons of feed. Most of these firms had limited storage capacity (Table 1) and depended upon the farm and elevator sectors for a continual supply of grain. Although some feed manufacturers did sell grain and retail farm supplies, these firms primarily specialized in the manufacture and sale of feed. In 1970, the gross income earned from the feed manufacturing activity averaged 92% of the total earned income. In contrast, country and terminal elevators earned 47.2% and 76.1% of their gross income, respectively, from the sale of raw grain.

The storage capacity per flour mill varied substantially. Three firms had less than 700,000 bushels of capacity and three had more than 1 million bushels (Table 1). All firms which specialized in the manu-

TABLE 2.—Percent of Country, Terminal, and Export Elevators and Grain Processors Performing Specific Services in Ohio, 1970.

	Firm Type				
	Elevators		Processors		
Type of Service	Country	Terminal and Export	Feed Manufacturers	Soybean Processors	Flour Millers and Blenders
Receive grain directly from farmers	100.0	85.7	28.6	0.0	16.6
Receive grain from other sources	3.6	100.0	100.0	100.0	100.0
Ship or sell whole grain to farmers	60.6	35.7	14.3	0.0	0.0
Ship or sell whole grain to others	98.7	100.0	71.4	33.3	16.6
Store grain commercially					
For farmers	67.2	78.6	14.3	0.0	0.0
For CCC	47.9	64.3	14.3	66.6	0.0
For others	2.6	85.7	14.3	66.6	66.6
Dry grain	70.2	28.6	14.3	0.0	0.0
For others	6.4	0.0	14.3	0.0	0.0
Receive grain in own or leased equipment	8.9	21.4	71.4	0.0	33.2
Ship out grain in own or leased equipment	7.0	57.1	14.3	0.0	0.0
Manufacture a complete feed	1.9	35.7	100.0	33.3	0.0
Manufacture a feed ingredient	21.7	7.1	14.3	33.3	0.0
Custom grind feed for farmers	92.6	7.1	14.3	0.0	0.0
Sell feed to farmers	91.7	14.3	42.8	0.0	0.0
Deliver feed to farmers	90.6	14.3	42.8	0.0	0.0
Sell fertilizer to farmers	94.7	21.4	14.3	0.0	0.0
Retail farm supplies	84.9	14.3	28.6	0.0	0.0
Handle specialty grains produced under contract					
Contract for production of broilers	1.1	14.3	0.0	0.0	0.0
Contract for production of eggs	0.0	0.0	0.0	0.0	0.0
Produce any livestock or livestock products under contract	0.0	0.0	0.0	0.0	0.0
Process soybeans	0.0	0.0	0.0	100.0	0.0
Process corn	0.0	0.0	0.0	0.0	0.0
Process wheat	0.0	0.0	0.0	0.0	100.0
Shell corn	83.2	21.4	0.0	0.0	0.0
Other	0.0	0.0	14.3	33.3	0.0
Total Elevators, Number	470	14	8	3	6

TABLE 3.—Supply and Disappearance of Raw Grains (000 bu.) in Ohio.

Grain	Supply			Disappearance			
	Grain Supply* Ohio (a)	Grain Receipts from Other States (b)	Total (c)	Grain Used in Ohio (d)	Grain Shipments to Other States and for Export (e)	Total (f)	Net Shipments = Shipments — Receipts (g) = (e) — (b)
Corn	251,588	20,109	271,697	136,361	135,336	271,697	115,227
Beans	71,144	28,186	99,330	38,628	60,702	99,330	32,516
Wheat	38,759	9,109	47,868	28,134	19,734	47,868	10,625
Oats	36,635	1,111	37,746	26,438	11,308	37,746	10,197

*Total grain supply is equal to 1970 production plus Jan. 1, 1970, inventory minus Jan. 1, 1971, inventory.
SOURCE: U. S. Dept. of Agriculture, Agricultural Statistics, U. S. Government Printing Office, Washington, D. C., 1971-1972; U. S. Dept. of Agriculture, Ohio Agricultural Statistics, Columbus, 1971-1972.

facture of flour earned 100% of the total income from this activity. All grain stored in the firms was used in the milling process.

The available storage capacity also varied among the three soybean processing firms (Table 1). Unlike the flour millers, soybean processors are not totally specialized. These firms process soybeans, ship raw grain to non-farm firms, manufacture feed, and wholesale farm supplies (Table 2). All grain stored in these facilities was owned by the firm and was used in the processing activity or was sold as raw grain.

TOTAL GRAIN SUPPLY AND DISAPPEARANCE

The total supply of raw grain and its disappearance is reported in Table 3. Supply and disappearance of processed grain is not reported in this study. Since Ohio was a surplus grain producing state, interstate shipments exceeded interstate receipts for all four grains. Net shipments to other states and to export accounted for 45.8%, 45.7%, 27.4% and 27.8% of the corn, bean, wheat, and oat supplies, respectively (Table 3). In Ohio, corn and oats were primarily used for feed; 85% of the corn and 90% of the oats were fed to livestock. The remaining amounts were used for seed or were absorbed by processors. Only small quantities of corn and oats were received from other states.

Although producers supply more beans and wheat than could be consumed in Ohio, 28.4% and 19% of the total bean and wheat supplies, respectively, were obtained from other states. These receipts satisfied some of the demands for beans and wheat by processors and by exporters located in Ohio. Approximately 90% of the beans and 91% of the wheat used in Ohio were absorbed by bean processors and flour millers and blenders. Only small amounts of these two grains were used for either feed or seed.

[5]Agricultural Statistics, 1971. Statistical Reporting Service, U. S. Dept. of Agriculture. Columbus, Ohio, p. 33.

GRAIN RECEIPTS BY GRAIN ELEVATORS AND PROCESSORS

Corn Receipts from Farms in Ohio

In 1970, elevator and processing firms reported receiving 169.7 million bushels of corn from farms (Table 4). Approximately 118 million bushels were sold by farmers to non-farm firms.[5] The remaining 51.7 million bushels were either commercially stored for future sale, stored in a grain bank, or used to meet on-farm feed demands.

Approximately 67.1% of the corn receipts moved from the farm to elevator and processing firms during October, November, and December. For the state, monthly receipts averaged 14.1 million bushels, ranging from a low of 4.7 million bushels in May to a high of 50.9 million in November. The large flow of grain during the harvest season resulted in an annual standard deviation coefficient of 16.1 million bushels. If grain receipts from the harvest period (October, November, and December) are excluded, monthly grain receipts average 6.2 million bushels and the standard deviation coefficient declines to 1.3 million bushels.

Country elevators, receiving 76% of the total corn receipts, were the primary recipients of farm shipments; terminals reported receiving 23% of the total and processors reported receiving less than 1% (Table 4). In central and southwestern Ohio (SM-42 area 25, Fig. 1), country and terminal elevators reported receiving 76% and 21% of the total farm shipments, respectively. The remaining 2% was received by grain processing firms.

Country elevators located in northwestern and eastern Ohio (SM-42 area 50, Fig. 1) also reported receiving 76% of the total farm shipments; receipts by terminals increased to 24% of the total. Processing firms in area 50 did not report receiving grain from farms. Since all grain processing firms reported receiving only small quantities of corn from

TABLE 4.—Monthly Corn Receipts (000 bu.) by Elevators and Grain Processors from Farm Producers in Ohio, 1970.

Firm Type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
							SM-42 Area 25						
Country Elevators	3,098	2,552	1,637	1,390	1,327	1,836	1,696	1,540	3,065	22,851	20,291	4,698	65,981
Terminal and Export Elevators	1,503	1,207	1,259	1,287	1,287	1,114	988	1,005	930	2,159	4,096	1,837	18,663
Feed Manufacturers and Mills	139	135	167	117	153	142	223	203	171	420	205	95	2,170
Soybean Processors	2	2	2	2	3	2	2	2	2	2	2	2	25
Total	4,742	3,896	3,065	2,787	2,770	3,094	2,909	2,750	4,168	25,432	24,594	6,632	86,839
							SM-42 Area 50						
Country Elevators	3,445	2,856	1,885	1,415	1,327	1,802	1,711	1,879	1,994	18,324	20,981	5,628	63,247
Terminal and Export Elevators	533	541	508	672	645	1,062	817	805	1,731	4,855	5,326	2,122	19,617
Total	3,978	3,397	2,393	2,087	1,972	2,864	2,528	2,684	3,725	23,179	26.307	7,750	82,864
							State						
Country Elevators	6,543	5,408	3,522	2,805	2,654	3,638	3,407	3,419	5,059	41,175	41,272	10,326	129,228
Terminal and Export Elevators	2,036	1,748	1,767	1,950	1,932	2,176	1,805	1,810	2,661	7,014	9,422	3,959	38,280
Feed Manufacturers and Mills	139	135	167	117	153	142	223	203	171	420	205	95	2,170
Soybean Processors	2	2	2	2	3	2	2	2	2	2	2	2	25
Total	8,720	7,293	5,458	4.874	4,742	5,958	5,437	5,434	7,893	48,611	50,901	14,382	169,703

TABLE 5.—Monthly Soybean Receipts (000 bu.) by Elevators and Grain Processors from Farm Producers in Ohio, 1970.

Firm Type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
							SM-42 Area 25						
Country Elevators	943	224	144	484	409	161	177	130	3,402	15,872	4,308	4,044	30,298
Terminal and Export Elevators	56	91	57	96	132	79	42	29	47	555	175	108	1,467
Feed Manufacturers and Mills	1	4	24	4	12	25	15	34	95	92	11	3	320
Total	1,000	319	225	584	553	265	234	193	3,544	16,519	4,494	4,155	32,085
							SM-42 Area 50						
Country Elevators	1,152	145	163	612	571	87	63	26	2,815	16,560	4,203	1,112	27,509
Terminal and Export Elevators	650	675	355	461	469	700	250	259	600	3,600	1,491	650	10,160
Total	1,802	820	518	1,073	1,040	787	313	285	3,415	20,160	5,694	1,762	37,669
							State						
Country Elevators	2,095	369	307	1,096	980	248	240	156	6,217	32,432	8,511	5,156	57,807
Terminal and Export Elevators	706	766	412	557	601	779	292	288	647	4,155	1,666	758	11,627
Feed Manufacturers and Mills	1	4	24	4	12	25	15	34	95	92	11	3	320
Total	2,802	1,139	743	1,657	1,593	1,052	547	478	6,959	36,679	10,188	5,917	69,754

farms, the demands by these firms were obviously met by obtaining a supply of corn from country and terminal elevators.

All country elevators reported receiving 72% of their farm shipments during October, November, and December (Table 4). Country elevators located in the respective SM-42 areas also reported similar receiving percentages for the last quarter of the year. Approximately 53% of the farm shipments destined to terminal elevators moved during the same time period. Terminal elevators in area 25 received only 43% of the total during the last 3 months of the year, while firms in area 50 received 63% of the total. Since terminal elevators in SM-42 areas 25 and 50 had different storage capacities, merchandised different quantities of grain, and served different grain marketing outlets, grain flow patterns and prices would obviously vary between these two areas.[6]

Corn Receipts from Firms in Other States

The commercial grain industry in Ohio reported receiving only 20.1 million bushels of corn from farms and elevators located in other states (Table 3 and Appendix Table I); 12.7 million bushels and 7.4 million bushels, respectively, were obtained from Indiana and Michigan (Appendix Table I). Approximately 93% of this grain was trucked to country and terminal elevators located near the Ohio border. Because of the rate structure and convenience, trucks were the predominant mode of transportation. Firms in area 25 received 64%, with the remainder received by firms in area 50. Additional delineation of these data suggests that most of these receipts moved to firms specializing in out-of-state shipments, including exports.

Soybean Receipts from Farms in Ohio

Elevator and grain processing firms reported receiving 69.8 million bushels of soybeans from Ohio farms in 1970 (Table 5). Approximately 52% of these receipts moved during October, and 85.6% moved during the last 4 months of the year. Monthly receipts for all elevator and processing firms averaged 5.8 million bushels, ranging from a low of 478,000 bushels in August to a high of 36.7 million in October. The standard deviation coefficient for the 12-month period was 9.8 million bushels. If grain receipts for the harvest period (September, October, and November) are excluded, monthly grain receipts average 1.8 million bushels and the standard deviation coefficient declines to 1.6 million bushels. Country and terminal elevators reported receiving 99.5% of the total farm shipments.

[6]Sharp, J. W. and E. D. Baldwin. April 1975. Seasonal Corn Price Differentials in the Cincinnati and Toledo Markets. Ohio Agri. Res. and Dev. Center, Res. Circ. 203, pp. 9-10.

Soybean Receipts from Firms in Other States

Although Ohio produces a surplus of beans, 28.2 million bushels or 28.4% of the total supply were obtained from farms and elevators located in Indiana and Michigan (Table 3 and Appendix Table II). Approximately 98.3% of the grain receipts was delivered by truck to either soybean processors or to elevators which exported and merchandised grain into other deficit areas. Truck traffic was the predominant mode of transportation because many of these out-of-state receipts originated on farms. In addition, short distance rail rates were relatively high compared to alternative truck rates.

Since the Toledo export market and the soybean processing industry were located in SM-42 area 50, the majority of the out-of-state bean receipts (75.6%) moved to this area. Only 24.4% of the total was received by firms in SM-42 area 25. These out-of-state receipts primarily moved to processors, terminal, and country elevators in the Cincinnati area.

Wheat Receipts from Farms in Ohio

In 1970, all elevators and processing firms reported receiving 33.5 million bushels of wheat from farms (Table 6). Approximately 75.7% of these receipts moved during July and 89.5% moved during the third quarter of the year. Monthly receipts averaged 2.8 million bushels, ranging from a low of 82,000 bushels in November to a high of 25.4 million in July. The standard deviation coefficient for the 12-month period was 6.8 million bushels. If grain receipts from the harvest period (July, August) are excluded, monthly grain receipts average 514,000 bushels and the standard deviation coefficient declines to 485,505 bushels.

Country and terminal elevators reported receiving 90.7% and 9.3% of the total, respectively (Table 6). Since grain processing firms did not report receiving grain from farms, their respective demands were met by receiving a supply from country and terminal elevators. Comparable grain movements also existed for all firms in the respective SM-42 areas.

Wheat Receipts from Firms in Other States

Approximately 9.1 million bushels of wheat were received from farms and elevators in Michigan, Wisconsin, Indiana, Illinois, and Pennsylvania (N.E.) (Table 3 and Appendix Table III). These receipts, which comprised 19% of the total wheat supply (Table 3), moved primarily to processors and terminal elevators. Since most processors and the export market were located in area 50, it is not surprising that 75.1% of the total receipts moved into this area and only 24.9% moved into area 25 (Appendix Table III).

Approximately 54.2% of the wheat receipts were railed into Ohio, 21.5% moved by truck, and the re-

TABLE 6.—Monthly Wheat Receipts (000 bu.) by Elevators and Grain Processors from Farm Producers in Ohio, 1970.

Firm Type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
							SM-42 Area 25						
Country Elevators	153	174	128	166	119	62	12,034	1,066	666	71	26	41	14,706
Terminal and Export Elevators	11	12	79	59	55	12	400	297	54	11	9	9	1,008
Total	164	186	207	225	174	74	12,434	1,363	720	82	35	50	15,714
							SM-42 Area 50						
Country Elevators	235	122	151	166	139	1,047	11,653	1,441	690	26	14	22	15,706
Terminal and Export Elevators	71	76	50	31	18	18	1,286	200	200	67	33	47	2,097
Total	306	198	201	197	157	1,065	12,939	1,641	890	93	47	69	17,803
							State						
Country Elevators	338	296	279	332	258	1,109	23,687	2,507	1,356	97	40	63	30,412
Terminal and Export Elevators	82	88	129	90	73	30	1,686	497	254	78	42	56	3,105
Total	470	384	408	422	331	1,139	25,373	3,004	1,610	175	82	119	33,517

TABLE 7.—Monthly Oats Receipts (000 bu.) by Elevators and Grain Processors from Farm Producers in Ohio, 1970.

Firm Type	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
							SM-42 Area 25						
Country Elevators	58	74	57	43	41	50	5,506	1,540	76	25	24	44	7,538
Terminal and Export Elevators	23	55	47	37	23	1	410	337	23	23		22	1,001
Feed Manufacturers and Mills	61	56	44	43	46	46	186	96	43	40	40	44	745
Total	142	185	148	123	110	97	6,102	1,973	142	88	64	110	9,284
							SM-42 Area 50						
Country Elevators	18	18	18	18	19	13	3,633	728	11	7	10	13	4,506
Terminal and Export Elevators	45	25	35	30	39	45	448	639	83	17	15	63	1,484
Total	63	43	53	48	58	58	4,081	1,367	94	24	25	76	5,990
							State						
Country Elevators	76	92	75	61	60	63	9,139	2,268	87	32	34	57	12,044
Terminal and Export Elevators	68	80	82	67	62	46	858	976	106	40	15	85	2,485
Feed Manufacturers and Mills	61	56	44	43	46	46	186	96	43	40	40	44	745
Total	205	228	201	171	168	155	10,183	3,340	236	112	89	186	15,274

maining 24.3% moved by water (Appendix Table V). Rail was a predominant mode of transportation for wheat because most transit rail rates were more competitively priced than the alternative truck rates. In addition, only a limited number of Ohio's processing firms can receive grain by water transport.

Oats Receipts from Ohio Farms and Out-of-State Firms

Since large volumes of oats were used on the farm to meet feed demands, elevator and processing firms reported receiving only 15.3 million bushels (42% of the domestic supply) of oats from Ohio farmers in 1970 (Table 7). Approximately 66.7% of these receipts moved during July; 88.5% moved during July and August. Monthly receipts averaged 1.3 million bushels, ranging from a low of 89,000 bushels in November to a high of 10.2 million bushels in July. The standard deviation coefficient for the 12-month period was 2.8 million bushels. If grain receipts for the harvest period (July and August) are excluded, grain flows from farm to elevators and processors become more even, averaging 175,000 bushels for the 10-month period. The standard deviation coefficient for this 10-month time frame was 47,207 bushels.

Country, terminal, and processing firms reported receiving 78.8%, 16.3%, and 4.9% of the total farm shipments, respectively (Table 7). The results from these data emphasize that processors received most of their grain from non-farm firms. Indeed, feed manufacturers and mills reported receiving primarily "crimped" oats rather than whole oats. Although firms located in SM-42 area 25 received nearly 67.3% more oats than firms located in area 50, comparable grain movements existed in each of these areas.

As shown in Appendix Table IV, only 1.1 million bushels of oats were received from farms and elevators located in Michigan, Wisconsin, Indiana, and Pennsylvania (N.E.). Approximately 95.2% of the receipts moved to firms located in area 50. All out-of-state receipts moved to either terminal elevators or feed manufacturers. About 65% of the out-of-state receipts moved by rail and 37.5% moved by truck (Appendix Table V). Since more than half of the oats originated in areas as far away as Wisconsin, the long distance rail rates were lower than the comparable truck rates.

TOTAL GRAIN RECEIPTS BY MODE OF TRANSPORTATION AND GRAIN TYPE

The data in Appendix Tables I-V emphasize that receipts from Ohio farmers and out-of-state firms were predominantly arriving at the elevator or processing firms by truck. Indeed, 100% and 83.4% of all farm and out-of-state receipts, respectively, were trucked to elevator and processing firms. Since these data exclude intrastate transfers of grain among non-farm firms, the importance of the rail traffic may be understated. This was especially true for wheat where favorable transit rail rates make it economically feasible to transfer grain short distances by rail.

In 1970, all firms in Ohio reported receiving 346.8 million bushels of grain; 83.1% was received from farms in Ohio and 16.9% was received from firms in other states. Monthly receipts averaged 28.9 million bushels. Elevator and processing firms were under the most stress in October and November, receiving 146.8 million bushels or 42.3% of all receipts. Approximately 63.6 million bushels or 18.4% of the total receipts also moved to elevator and processing firms during the wheat and oats harvests (July and August). An additional 136.4 million bushels or 29.3% of the total moved during the remainder of the year.

Country and terminal elevators were the primary first handlers of all grain receipts. In 1970, 230.6 million bushels or 66.5% of the total grain receipts were received by country elevators; terminals received 90.6 million or 26.1% of the total and processors received the remaining 7.4%. Receipts from Ohio farmers primarily moved to country and terminal elevators, while receipts from out-of-state firms moved primarily to terminal elevators and processing firms.

INTERSTATE GRAIN SHIPMENTS BY GRAIN ELEVATORS AND PROCESSORS

Firms located in Ohio primarily shipped raw grain into the deficit areas of the Southeastern and Northeastern United States. The westerly flow of grain was limited by the comparative locational advantage of firms located in the grain surplus regions of Indiana, Illinois, Iowa, Missouri, etc. Approximately 36.8% of all raw grain shipments from Ohio were exported (Appendix Tables VI-XIII.). In 1970, all reported exports moved through the Toledo port or were railed to the East Coast. The supply and disappearance of processed grain was not reported in this study.

Interstate Corn Shipments

In 1970, 135.3 million bushels (53.8% of the total supply) of corn were transported from Ohio to other states and to export (Tables 3 and 8 and Appendix Tables VI and VII). Approximately 27.2% of the total corn shipments moved during the last quarter of the year. For the state as a whole, monthly shipments averaged 11.3 million bushels, ranging from a high of 17.6 million bushels in November to a low of 5.1 million in September. The standard deviation for this 12-month period was 3.9 million bushels. Firms in SM-42 area 50 moved 50.5% of the total shipments, while those in area 25 moved 49.5%.

TABLE 8.—Monthly Grain Shipments (000 bu.) to Firms in Other States and to Export as Reported by Elevators and Grain Processing Firms in Ohio, 1970.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
SM-42 Area 25													
Corn	7,772	7,517	5,795	5,440	5,574	4,817	4,911	3,444	2,740	6,193	8,267	4,526	66,996
Beans	1,701	1,645	1,253	1,044	1,138	858	258	368	429	3,224	1,460	1,209	14,587
Wheat	476	331	346	1,223	199	129	3,580	1,255	819	442	582	623	10,005
Oats	114	188	169	147	104	103	1,410	654	306	188	140	112	3,635
Total	10,063	9,681	7,563	7,854	7,015	5,907	10,159	5,721	4,294	10,047	10,449	6,470	95,223
SM-42 Area 50													
Corn	9,232	8,748	5,167	4,876	7,459	5,602	4,444	2,588	2,326	5,598	9,296	3,004	68,340
Beans	2,984	2,885	1,440	2,986	2,514	1,948	857	329	438	14,845	7,474	7,415	46,115
Wheat	348	265	405	1,146	234	183	3,641	1,155	712	749	500	391	9,729
Oats	601	740	778	609	536	431	876	1,188	495	482	446	491	7,673
Total	13,165	12,638	7,790	9,617	10,743	8,164	9,548	5,260	3,971	21,674	17,716	11,301	131,857
State													
Corn	17,004	16,265	10,962	10,316	13,033	10,419	9,355	6,032	5,066	11,791	17,563	7,530	135,336
Beans	4,685	4,530	2,693	4,030	3,652	2,806	1,115	697	867	18,069	8,934	8,624	60,702
Wheat	824	596	751	2,369	433	312	7,221	2,410	1,531	1,191	1,082	1,014	19,734
Oats	715	928	947	756	640	534	2,286	1,842	801	670	586	603	11,308
Total	23,228	22,319	15,353	17,471	17,758	14,071	19,977	10,981	8,265	31,721	28,165	17,771	227,080

In 1970, 59.5 million bushels of corn were shipped into eight different Southern states (Appendix Tables VI and VII). Shipments to the Virginia-West Virginia and North Carolina areas measured 28 million and 20.5 million bushels, respectively. Smaller quantities were also supplied to South Carolina, Kentucky, Alabama, and Georgia. Since some Cincinnati firms located in SM-42 area 25 have an exclusive point-to-point rail rate competitive advantage over firms located in SM-42 area 50, 79.1% of the Southern grain shipments originated in the former SM-42 area while only 20.9% originated in area 50.

The rail rate and locational comparative advantage was pronounced for shipments into Alabama, Georgia, Kentucky, South Carolina, Tennessee, and North Carolina. Indeed, 94.2% of these shipments originated at firms located in SM-42 area 25. Firms from area 25 railed 89.5% of their shipments into this six-state area. On the other hand, firms from area 50 trucked 100% of their shipments into the same deficit area.

Most shipments into the eight Southern states originated in country and terminal elevators (Appendix Table VII). In SM-42 area 25, 57.2% and 42.5% of the total grain shipments originated in terminal and country elevators, respectively. Less than 1% of the total was shipped by processors. Approximately 96.4% of all grain shipments into the South by firms in area 50 originated in country elevators. Only 2.8% of the total was shipped by terminal elevators, and less than 1% of the total originated at processing firms. Firms which were defined as terminals in area 50 have a comparative rail rate and location advantage in merchandising grain into the Northeastern United States and to export. Hence, the relative inactivity of the terminal and export elevator in the Southern market was not surprising.

Shipments of corn to destinations outside the South measured 75.8 million bushels; 32.5 million, 30.6 million, and 11.4 million bushels were shipped into the Northeast, export, and Midwest, respectively. Corn shipments into the Northeast were dispersed into Pennsylvania, New York, and the New England areas. Approximately 19.9 million bushels or 61.3% of the grain shipments into the Northeast originated in country and terminal elevators in SM-42 area 50 (Appendix Table VII). Country elevators in area 50 shipped 53% of this area's total, while terminal elevators shipped 47%. Nearly 99% of all grain originating in area 50 moved into the Northeast by rail. Only 1% moved by truck (Appendix Table VI).

Firms located in SM-42 area 25 shipped 12.6 million bushels of corn into the Northeastern United

States. This represents 38.7% of the total shipments from Ohio to the Northeast. Country elevators located in area 25 shipped approximately 77.1% of this area's total, terminal elevators shipped 21.8%, and processors shipped 1.1%. Approximately 98% of the grain originating in area 25 moved by rail. The remaining 2% moved by truck.

In 1970, 30.6 million bushels of corn, 22.6% of the total shipments, were exported from Ohio. Firms located in SM-42 area 50 moved 17.9 million bushels through the Toledo port. In addition, these firms railed 10.2 million bushels to ports on the East Coast. Since most firms located in area 25 were land-locked, all corn exports (2.5 million bushels) were railed to the East Coast.

Small volumes of corn moved by truck from area 25 into Indiana. Grain trucked by Ohio farms to Indiana firms and reported in an Indiana unpublished survey were incorporated into these shipment data.[7] Non-farm firms located in area 50 reported railing and trucking grain into Wisconsin. Shipments into "other" states included grain movements to Michigan, Maryland, New Jersey, Delaware, and Florida.

Interstate Soybean Shipments

In 1970, firms from Ohio shipped 60.7 million bushels of beans to deficit areas in the United States and to export (Table 8 and Appendix Tables VIII and IX). These shipments constituted 61.1% of the total supply (Table 3). Approximately 58.7% of the total shipments moved during the last quarter of the year. Monthly shipments averaged 5.06 million bushels, ranging from a high of 18.1 million in October to a low of 697,000 in August. The standard deviation for this 12-month period was 4.7 million bushels. Bean shipments for the first three quarters of the year averaged 2.8 million bushels. The standard deviation coefficient for this 9-month period declined to 1.5 million bushels.

Approximately 49.2 million bushels or 81% of the total out-of-state shipments moved to export. Since large quantities were exported through the Toledo port, land-locked firms in SM-42 area 25 shipped only 14.6 million bushels of beans or 24% of the total. Country and terminal elevators located in area 25 shipped 5.7 million bushels into three Southern states (Appendix Tables VIII and IX). Approximately 94.7% of these shipments moved by rail, with the remainder moving by truck. These firms also exported 4.9 million bushels via the East Coast ports. Only small amounts of soybeans were railed or trucked to Indiana or into the Northeastern United States by firms in SM-42 area 25.

[7]Unpublished data collected at Purdue University as a part of the Southern Regional Grain Marketing Project, SM-42.

Firms from SM-42 area 50 shipped 46.1 million bushels or 76% of the state total to deficit areas in the U. S. and to export. In 1970, terminal elevators moved 42.9 million bushels or 70.7% of all shipments through the Toledo export market. Country and terminal elevators railed 1.3 million bushels to the East Coast. Only very small volumes were trucked and railed to other points such as Indiana, Michigan, Wisconsin, and other states. Some shipments into Indiana may have originated on Ohio farms.[8] Soybeans were not shipped into the South by any firms in area 50.

Interstate Wheat Shipments

Since 58.8% of the total supply of wheat was processed, fed, or used for seed in Ohio, only 19.7 million bushels were available for shipments to locations outside of the state (Table 3). Approximately 56.6% of the total moved during July, August, and September (Table 8). Monthly shipments averaged 1.6 million bushels, ranging from a high of 7.2 million bushels in July to a low of 312,000 bushels in June (Table 8). The standard deviation for the 12-month period was 1.8 million bushels. If the July grain shipments are excluded, out-of-state grain flows become more even, averaging 1.1 million bushels. The standard deviation coefficient for the 11-month period declined to 676,256 bushels.

Country and terminal elevators located in SM-42 area 25 railed and trucked 5.6 million bushels to seven states in the Southeastern United States (Appendix Tables X and XI). Except for shipments into the Virginia-West Virginia area and Kentucky, firms from area 50 did not ship wheat into the South. Almost all wheat moved into the Southern region by rail.

Grain was also shipped into the Northeastern United States, Wisconsin, and Michigan. In area 25, these shipments originated at country and terminal elevators. In area 50, processors as well as country and terminal elevators shipped grain into these deficit areas.

Wheat exports accounted for only 18.2% of the total shipments, 3.6 million bushels. Terminal elevators in area 50 moved approximately 2.2 million bushels of wheat through the Toledo port. An additional 1.1 million bushels were railed to ports on the East Coast. Country elevators in area 25 also reported railing 350,000 bushels to ports on the East Coast.

Interstate Oats Shipments

Since 26.4 million bushels of the 37.7 million bushels of oats were used for feed or seed in Ohio (Table 3), only 11.3 million bushels were available

[8]As identified in unpublished data collected at Purdue University as a part of the Southern Regional Grain Marketing Project, SM-42.

for shipment to points outside Ohio. Approximately 36.5% of the total shipments moved during July and August (Table 8). Monthly shipments averaged 942,333 bushels and ranged from a high of 2.3 million bushels in July to a low of 534,000 bushels in June. The standard deviation for this 12-month period was 524,076 bushels.

Country and terminal elevators located in SM-42 area 25 shipped 2.1 million bushels of grain to six states in the Southeastern United States. Approximately 86.1% of these shipments moved by rail. Except for shipments into the Virginia-West Virginia area, only small quantities of oats were shipped to the South by firms in area 50.

Firms from SM-42 area 50 trucked and railed oats into the Northeastern United States and into Wisconsin and Michigan. An additional 200,000 bushels were railed to the East Coast for export. Firms in SM-42 area 25 trucked and railed small quantities into Indiana and to the Northeast. Some shipments into Indiana may have originated on Ohio farms.[9] Firms from area 25 did not report any exports.

TOTAL GRAIN SHIPMENTS BY FIRM TYPE AND MODE OF TRANSPORTATION

In 1970, Ohio firms reportedly shipped 227.1 million bushels of grain to deficit areas in the United States and to export (Table 8 and Appendix Table XIV). Shipments originated primarily at country and terminal elevators. The latter group moved 60.6% of the out-of-state shipments, while country elevators moved 38.3% of the total. Less than 1% was moved by all Ohio processors. Elevator and processing firms moved 63%, 27.7%, and 9.3% of all out-of-state shipments by rail, water, and truck, respectively (Appendix Table XV). All reported water shipments moved through the Toledo port in area 50.

Monthly interstate grain shipments averaged 18.9 million bushels, ranging from a low of 8.3 million in September to a high of 28.2 million in November (Table 8). The standard deviation for the 12-month period was 6.4 million bushels. Although grain was stored throughout the year, the transportation system was primarily under stress during the corn and soybean harvest periods (October and November) and during the early winter feeding period (January and February). During this 4-month period, 105.4 million bushels or 46.4% of all grain shipments were transported out of the state. These specific flow patterns were also in evidence for both SM-42 areas.

Firms from area 50 shipped 131.8 million bushels or 58.1% of the total out-of-state shipments. Because of the Toledo export facility, terminal and export elevators in area 50 were more actively involved in the shipping functions, moving 69.4% of the total. Country elevators in this area moved only 30% of all out-of-state shipments. Since country and terminal elevators in area 25 shipped grain primarily to deficit areas in the U.S. and faced similar transportation costs, the two groups were equally involved in the shipping activity. For example, country elevators moved 51.1% of the total, while terminals moved 48.5%.

Approximately 163.85 million bushels of grain were moved among firms within the state. Elevators reported trucking 3.05 million bushels or 2% of the intrastate grain shipments to farms. Grain processors did not ship any unprocessed grain to farms. An additional 160.8 million bushels or 98% of the total intrastate grain shipments moved among non-farm firms. Country elevators were primarily shipping grain to terminal elevators and grain processors. Terminals did not report shipments to country elevators but did supply grain to processors. Processors in turn shipped only very small quantities to large country and terminal elevators. Of the reported intrastate grain movements, the trucking activity was most important, moving 74.2% of the total. Only 25.8% moved by rail.

CONCLUSIONS

Existing supply, demand, transportation, production, and marketing practices have in part molded a grain marketing structure in which large numbers of grain elevators provide similar marketing services and functions. For example, elevators earn most of their income from the grain merchandising function, most elevators buy and sell grain to farms, most provide drying and storage services, most retail or wholesale farm supplies, and most sell grain to interstate and intrastate buyers. Because of these similarities, the traditional labels of country, terminal, sub-terminal export, etc., elevators are fast becoming an outdated classification system.

Since a large number of relatively small firms execute similar marketing functions, the data suggest that a relatively large degree of competition still exists in the grain marketing system. The degree of competition is limited by a firm's ability to differentiate the manner in which the services are provided. Each firm generated some differentiation by its physical location and, more importantly, by its ability to provide a high quality, flexible set of services. Although entry into the grain marketing system is still relatively open, the degree of existing differentiation obviously affects the decision process and initiated success of any new firm.

[9]Unpublished data from Indiana were included with the Ohio statistics. Data were collected by Purdue University as part of the Southern Regional Grain Marketing Project, SM-42.

Although the marketing habits, functions, and practices of all elevators are merging, the marketing functions performed by this group of firms are very distinct from those performed by grain processors. For example, most processors do not buy and sell whole grain to farms. Most do not dry and store corn for farms or other firms. Most do not sell farm supplies, and most do not ship whole grain to other firms. These firms primarily earn most of their income from the production and sale of processed grain.

Ohio firms reported receiving grain primarily from local farms. Although the largest fraction of this grain moved during the respective harvest season, the monthly flow of grain from farms to elevators and processing firms suggests that farms were providing some of the storage and drying functions. Small amounts of grain were received from elevators and farms in neighboring states. Most of these receipts moved to large country elevators, terminal elevators, or processors in area 50.

Since most interstate and intrastate corn and bean receipts moved by truck, rail abandonment policy of any type may have only limited impact upon the movement of these grains from farms and from firms in other states to elevators and processing firms in Ohio. Similarly, rail abandonment policy may have only limited impact on the small volume of oats receipts. Since large volumes of interstate and intrastate wheat receipts moved by rail, rail abandonment policy may affect wheat flow patterns and the future structure and location of wheat processing plants.

Grains originating in Ohio were shipped primarily to firms located in the Northeastern and Southeastern United States. Large volumes were also exported through the Toledo and East Coast ports. The domestic interstate grain shipments originated at either country or terminal elevators. Most grain exports originated at terminal elevators. Because of the large volume of exports, terminal elevators as a class were most actively involved in the interstate and export shipping activity. Processing firms were not significantly involved in either the interstate or export shipping activity.

Since corn, soybeans, and wheat exports were relatively large, past and future trade policies may have a major impact on the production and marketing of these grains. Oats production and marketing will only be indirectly influenced by changes in trade policy.

Although the largest fraction of all shipments moved during the respective harvesting season, the differences in shipments and receipts flow patterns clearly indicate that the elevators and processors are also providing some of the storage function. Elevators located in the south-southwestern part of the state (SM-42 area 25) primarily ship grain into the Southeastern and Northeastern United States. Some grain is railed to the export points on the East Coast. Firms in the north-northwestern part of the state (SM-42 area 50) primarily ship grain into the Northeastern United States and to the Toledo export points. Smaller amounts are also shipped into the Southeastern United States and to export points on the East Coast.

Since most interstate grain shipments and most shipments to export points move by rail, rail abandonment policy may influence the aggregated interstate shipment patterns, and the location, marketing structure, and/or marketing strategies of Ohio elevator firms.

APPENDIX

APPENDIX TABLE I.—Corn Receipts (000 bu.) by State and Mode as Reported by Elevators and Grain Processing Firms in Ohio, 1970.

	Mich.	Ind.	Total
		SM-42 Area 25	
All modes	1,134	11,691	12,825
Truck	1,017	11,074	12,091
Rail	117	617	734
		SM-42 Area 50	
All modes	6,233	1,051	7,284
Truck	5,769	839	6,608
Rail	464	212	676
		State	
All modes	7,367	12,742	20,109
Truck	6,786	11,913	18,699
Rail	581	829	1,410

APPENDIX TABLE II.—Soybean Receipts (000 bu.) by State and Mode as Reported by Elevators and Grain Processing Firms in Ohio, 1970.

	Mich.	Ind.	Total
		SM-42 Area 25	
All modes	1,152	5,713	6,865
Truck	1,017	5,467	6,484
Rail	135	246	381
		SM-42 Area 50	
All modes	2,234	19,087	21,321
Truck	2,234	18,981	21,215
Rail		106	106
		State	
All modes	3,386	24,800	28,186
Truck	3,251	24,448	27,699
Rail	135	352	487

APPENDIX TABLE III.—Wheat Receipts (000 bu.) by State and Mode as Reported by Elevators and Grain Processing Firms in Ohio, 1970.

	Mich.	Wisc.	Ind.	Ill.	N.E.	Total
			SM-42 Area 25			
All modes			1,766	500		2,266
Truck			300			300
Rail			1,466	500		1,966
			SM-42 Area 50			
All modes	2,768	2,209	1,687		179	6,843
Truck	996		487		179	1,662
Rail	1,772		1,200			2,972
Water		2.209				2,209
			State			
All modes	2,768	2,209	3,453	500	179	9,109
Truck	996		787		179	1,962
Rail	1,772		2,666	500		4,938
Water		2,209				2,209

APPENDIX TABLE IV.—Oats Receipts (000 bu.) by State and Mode as Reported by Elevators and Grain Processing Firms in Ohio, 1970.

	Mich.	Wisc.	Ind.	Ill.	N.E.	Total
			SM-42 Area 25			
All modes			53			53
Truck			53			53
			SM-42 Area 50			
All modes	330	568	60		100	1,058
Truck	303		60			363
Rail	27	568			100	695
			State			
All modes	330	568	113		100	1,111
Truck	303		113			416
Rail	27	568			100	695

APPENDIX TABLE V.—Out-of-State Grain Receipts (000 bu.) by Mode as Reported by Elevators and Grain Processing Firms in Ohio, 1970.

	Truck	Rail	Water
	SM-42 Area 25		
Corn	12,091	734	
Beans	6,484	381	
Wheat	300	1,966	
Oats	53		
Total Grain	18,928	3,081	
	SM-42 Area 50		
Corn	6,608	676	
Beans	21,215	106	
Wheat	1,662	2,972	2,209
Oats	363	695	
Total Grain	29,848	4,439	2,209
	State		
Corn	18,699	1,410	
Beans	27,699	487	
Wheat	1,962	4,938	2,209
Oats	416	695	
Total Grain	48,776	7,520	2,209

APPENDIX TABLE VI.—Corn Shipments (000 bu.) to Firms in Other States and to Export by Mode as Reported by Elevators and Grain Processing Firms in Ohio, 1970.

	Ala.	Ga.	Ky.	S.C.	Tenn.	N.C.	Va. and W. Va.	Ind.	N.E.	Wisc.	Export	Other	Total
							SM-42 Area 25						
All modes	1,094	1,039	1,100	3,460	3,207	19,747	17,440	4,042*	12,573		2,544	750	66,996
Truck	1,094				1,508	500	2,225	4,042*	260			300	9,929
Rail		1,039	1,100	3,460	1,699	19,247	15,215		12,313		2,544	450	57,067
Water													
							SM-42 Area 50						
All modes		11	1,100			729	10,580		19,946	7,400	28,074	500	68,340
Truck		11	1,100			729	858		228	74		250	3,250
Rail							9,722		19,718	7,326	10,192	250	47,208
Water											17,882		17,882
							State						
All modes	1,094	1,050	2,200	3,460	3,207	20,476	28,020	4,042*	32,519	7,400	30,618	1,250	135,336
Truck	1,094	11	1,100		1,508	1,229	3,083	4,042*	488	74		550	13,179
Rail		1,039	1,100	3,460	1,699	19,247	24,937		32,031	7,326	12,736	700	104,275
Water											17,882		17,882

*These shipments include grain moved from farms in Ohio to elevators in Indiana.

APPENDIX TABLE VII.—Corn Shipments (000 bu.) to Firms in Other States and to Export by Firm Type as Reported by Elevators and Grain Processing Firms in Ohio, 1970.

	Ala.	Ga.	Ky.	S.C.	Tenn.	N.C.	Va. and W. Va.	Ind.	N.E.	Wisc.	Export	Other	Total
							SM-42 Area 25						
All firms	1,094	1,039	1,100	3,460	3,207	19,747	17,440	4,042*	12,573		2,544	750	66,996
Country Elevators	1,094	135	1,052	154	1,207	8,567	7,814	3,000*	9,692		1,454	400	34,569
Terminal, Sub-Terminal, and Export Elevators		904		3,306	2,000	11,180	9,578	1,042*	2,736		1,000	350	32,096
Processors			48				48		145		90		331
							SM-42 Area 50						
All firms		11	1,100			729	10,580		19,946	7,400	28,074	500	68,340
Country Elevators		11	1,000			729	10,241		10,572	1,165	5,844	300	29,862
Terminal, Sub-Terminal, and Export Elevators			100				248		9,374	6,235	22,230	200	38,387
Processors							91						91
							State						
All firms	1,094	1,050	2,200	3,460	3,207	20,476	28,020	4,042*	32,519	7,400	30,618	1,250	135,336
Country Elevators	1,094	146	2,052	154	1,207	9,296	18,055	3,000*	20,264	1,165	7,298	700	64,431
Terminal, Sub-Terminal, and Export Elevators		904	100	3,306	2,000	11,180	9,826	1,042*	12,110	6,235	23,230	550	70,483
Processors			48				139		145		90		422

*These shipments include grain moved from farms in Ohio to elevators in Indiana.

APPENDIX TABLE VIII.—Soybean Shipments (000 bu.) to Firms in Other States and to Export by Mode as Reported by Elevators and Grain Processing Firms in Ohio, 1970.

	S.C.	N.C.	Va. and W. Va.	Ind.	N.E.	Mich.	Export	Other	Total
				SM-42 Area 25					
All modes	2,564	3,054	98	2,520*	980		4,934	437	14,587
Truck	103	202		2,520*				300	3,125
Rail	2,461	2,852	98		980		4,934	137	11,462
Water									
				SM-42 Area 50					
All modes				919*		563	44,233	400	46,115
Truck				919*		91		10	1,020
Rail						472	1,332	390	2,194
Water							42,901		42,901
				State					
All modes	2,564	3,054	98	3,439*	980	563	49,167	837	60,702
Truck	103	202		3,439*		91		310	4,145
Rail	2,461	2,852	98		980	472	6,266	527	13,656
Water							42,901		42,901

*These shipments include grain moved from farms in Ohio to elevators in Indiana.

APPENDIX TABLE IX.—Soybean Shipments (000 bu.) to Firms in Other States and to Export by Firm Type as Reported by Elevator and Grain Processing Firms in Ohio, 1970.

	S.C.	N.C.	Va. and W. Va.	Ind.	N.E.	Mich.	Export	Other	Total
				SM-42 Area 25					
All firms	2,564	3,054	98	2,520*	980		4,934	437	14,587
Country Elevators	554	712	98	2,520*	281		2,916	300	7,381
Terminal, Sub-Terminal, and Export Elevators	2,010	2,342			699		2,000	137	7,188
Processors							18		18
				SM-42 Area 50					
All firms				919*		563	44,233	400	46,115
Country Elevators				919*		563	114	400	1,996
Terminal, Sub-Terminal, and Export Elevators							44,119		44,119
				State					
All firms	2,564	3,054	98	3,439*	980	563	49,167	837	60,702
Country Elevators	554	712	98	3,439*	281	563	3,030	700	9,377
Terminal, Sub Terminal, and Export Elevators	2,010	2,342			699		46,119	137	51,307
Processors							18		18

*These shipments include grain moved from farms in Ohio to elevators in Indiana.

APPENDIX TABLE X.—Wheat Shipments (000 bu.) to Firms in Other States and to Export by Mode as Reported by Elevators and Grain Processing Firms in Ohio, 1970.

	Ga.	Ky.	S.C.	Tenn.	N.C.	Va. and W. Va.	N.E.	Wisc.	Mich.	Export	Other	Total
						SM-42 Area 25						
All modes	472	65	249	1,969	1,768	1,048	1,884		2,121	350	79	10,005
Truck		65				4			711		79	859
Rail	472		249	1,969	1,768	1,044	1,884		1,410	350		9,146
Water												
						SM-42 Area 50						
All modes		60				856	2,828	900	1,640	3,245	200	9,729
Truck		60							252			312
Rail						856	2,828	900	1,388	1,087	200	7,259
Water										2,158		2,158
						State						
All modes	472	125	249	1,969	1,768	1,904	4,712	900	3,761	3,595	279	19,734
Truck		125				4			963		79	1,171
Rail	472		249	1,969	1,768	1,900	4,712	900	2,798	1,437	200	16,405
Water										2,158		2,158

APPENDIX TABLE XI.—Wheat Shipments (000 bu.) to Firms in Other States and to Export by Firm Type as Reported by Elevators and Grain Processing Firms in Ohio, 1970.

	Ga.	Ky.	S.C.	Tenn.	N.C.	Va. and W. Va.	N.E.	Wisc.	Mich.	Export	Other	Total
						SM-42 Area 25						
All firms	472	65	249	1,969	1,768	1,048	1,884		2,121	350	79	10,005
Country Elevators		65	93	455	960	448	894		1,252	350	79	4,596
Terminal, Sub-Terminal, and Export Elevators	472		156	1,514	808	600	990		869			5,409
						SM-42 Area 50						
All firms		60				856	2,828	900	1,640	3,245	200	9,729
Country Elevators		60				856	1,348	772	521		200	3,757
Terminal, Sub-Terminal, and Export Elevators							950	128	869	3,245		5,192
Processors							530		250			780
						State						
All firms	472	125	249	1,969	1,768	1,904	4,712	900	3,761	3,595	279	19,734
Country Elevators		125	93	455	960	1,304	2,242	772	1,773	350	279	8,353
Terminal, Sub-Terminal, and Export Elevators	472		156	1,514	808	600	1,940	128	1,738	3,245		10,601
Processors							530		250			780

APPENDIX TABLE XII.—Oats Shipments (000 bu.) to Firms in Other States and to Export by Mode as Reported by Elevators and Grain Processing Firms in Ohio, 1970.

	Ga.	S.C.	Tenn.	N.C.	Va. and W. Va.	Ind.	N.E.	Wisc.	Mich.	Export	Other	Total
						SM-42 Area 25						
All modes	347	41	245	932	507	320*	1,243					3,635
Truck			40	76	172	320*	22					630
Rail	347	41	205	856	335		1,221					3,005
Water												
						SM-42 Area 50						
All modes	32			68	1,093		4,976	1,089	175	200	40	7,673
Truck	32			24	292		1,416	68	75		40	1,947
Rail				44	801		3,560	1,021	100	200		5,726
Water												
						State						
All modes	379	41	245	1,000	1,600	320*	6,219	1,089	175	200	40	11,308
Truck	32		40	100	464	320*	1,438	68	75		40	2,577
Rail	347	41	205	900	1,136		4,781	1,021	100	200		8,731
Water												

*These shipments include grain moved from farms in Ohio to elevators in Indiana.

APPENDIX TABLE XIII.—Oats Shipments (000 bu.) to Firms in Other States and to Export by Firm Type as Reported by Elevators and Grain Processing Firms in Ohio, 1970.

	Ga.	S.C.	Tenn.	N.C.	Va. and W. Va.	Ind.	N.E.	Wisc.	Mich.	Export	Other	Total
						SM-42 Area 25						
All firms	347	41	245	932	507	320*	1,243					3,635
Country Elevators	83		95	128	325	320*	1,177					2,128
Terminal, Sub-Terminal, and Export Elevators	264	41	150	804	182		66					1,507
						SM-42 Area 50						
All firms	32			68	1,093		4,976	1,089	175	200	40	7,673
Country Elevators	32				823		2,534	289	175		40	3,893
Terminal, Sub-Terminal, and Export Elevators				68	270		2,442	800		200		3,780
						State						
All firms	379	41	245	1,000	1,600	320*	6,219	1,089	175	200	40	11,308
Country Elevators	115		95	128	1,148	320*	3,711	289	175		40	6,021
Terminal, Sub-Terminal, and Export Elevators	264	41	150	872	452		2,508	800		200		5,287

*These shipments include grain moved from farms in Ohio to elevators in Indiana.

APPENDIX TABLE XIV.—Grain Shipments (000 bu.) by Mode of Transportation and Type of Firm for SM-42 Areas 25, 50, and Ohio, 1970.

	Truck*	Rail*	Water	Total
	SM-42 Area 25			
All Firms	14,543	80,680		95,223
Country Elevators	9,416	39,258		48,674
Terminal and Export Elevators	5,120	41,080		46,200
Processors	7	342		349
	SM-42 Area 50			
All Firms	6,529	62,387	62,941	131,857
Country Elevators	4,517	34,991		39,508
Terminal and Export Elevators	1,921	26,616	62,941	91,478
Processors	91	780		871
	State			
All Firms	21,072	143,067	62,941	227,080
Country Elevators	13,933	74,249		88,182
Terminal and Export Elevators	7,041	67,696	62,941	137,678
Processors	98	1,122		1,220

*Does not include grain shipments to farmers or firms in Ohio.

APPENDIX TABLE XV.—Grain Shipments (000 bu.) by Mode of Transportation for SM-42 Areas 25, 50, and Ohio, 1970.

	Truck*	Rail*	Water
	SM-42 Area 25		
Corn	9,929	57,067	
Soybeans	3,125	11,462	
Wheat	859	9,146	
Oats	630	3,005	
Total Grain	14,543	80,680	
	SM-42 Area 50		
Corn	3,250	47,208	17,882
Soybeans	1,020	2,194	42,901
Wheat	312	7,259	2,158
Oats	1,947	5,726	
Total Grain	6,529	62,387	62,941
	State		
Corn	13,179	104,275	17,882
Soybeans	4,145	13,656	42,901
Wheat	1,171	16,405	2,158
Oats	2,577	8,731	
Total Grain	21,072	143,067	62,941

*Does not include grain shipments to farmers or firms in Ohio.

BETTER LIVING IS THE PRODUCT

of research at the Ohio Agricultural Research and Development Center. All Ohioans benefit from this product.

Ohio's farm families benefit from the results of agricultural research translated into increased earnings and improved living conditions. So do the families of the thousands of workers employed in the firms making up the state's agribusiness complex.

But the greatest benefits of agricultural research flow to the millions of Ohio consumers. They enjoy the end products of agricultural science—the world's most wholesome and nutritious food, attractive lawns, beautiful ornamental plants, and hundreds of consumer products containing ingredients originating on the farm, in the greenhouse and nursery, or in the forest.

The Ohio Agricultural Experiment Station, as the Center was called for 83 years, was established at The Ohio State University, Columbus, in 1882. Ten years later, the Station was moved to its present location in Wayne County. In 1965, the Ohio General Assembly passed legislation changing the name to Ohio Agricultural Research and Development Center—a name which more accurately reflects the nature and scope of the Center's research program today.

Research at OARDC deals with the improvement of all agricultural production and marketing practices. It is concerned with the development of an agricultural product from germination of a seed or development of an embryo through to the consumer's dinner table. It is directed at improved human nutrition, family and child development, home management, and all other aspects of family life. It is geared to enhancing and preserving the quality of our environment.

Individuals and groups are welcome to visit the OARDC, to enjoy the attractive buildings, grounds, and arboretum, and to observe first hand research aimed at the goal of Better Living for All Ohioans!

The State Is the Campus for Agricultural Research and Development

Ohio's major soil types and climatic conditions are represented at the Research Center's 13 locations.

Research is conducted by 15 departments on more than 7200 acres at Center headquarters in Wooster, eight branches, Green Springs Crops Research Unit, Pomerene Forest Laboratory, North Appalachian Experimental Watershed, and The Ohio State University.

Center Headquarters, Wooster, Wayne County: 1953 acres

Eastern Ohio Resource Development Center, Caldwell, Noble County: 2053 acres

Green Springs Crops Research Unit, Green Springs, Sandusky County: 26 acres

Jackson Branch, Jackson, Jackson County: 344 acres

Mahoning County Farm, Canfield: 275 acres

Muck Crops Branch, Willard, Huron County: 15 acres

North Appalachian Experimental Watershed, Coshocton, Coshocton County: 1047 acres (Cooperative with Agricultural Research Service, U. S. Dept. of Agriculture)

North Central Branch, Vickery, Erie County: 335 acres

Northwestern Branch, Hoytville, Wood County: 247 acres

Pomerene Forest Laboratory, Coshocton County: 227 acres

Southern Branch, Ripley, Brown County: 275 acres

Western Branch, South Charleston, Clark County: 428 acres